

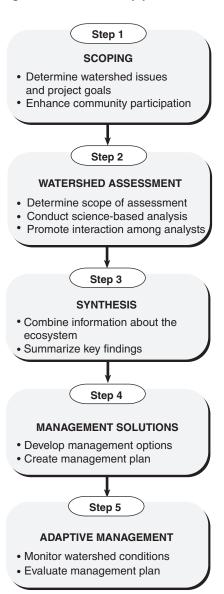
This portion of the guide describes the methods and tools for implementing the WAM process. The guide is written primarily for environmental professionals who wish to implement a WAM process.

The WAM process comprises five general steps (Figure 1). Detailed guidance on conducting each step is provided in the five corresponding sections of this manual. The following paragraphs provide an overview of how WAM can be used to meet watershed management objectives. The five steps of the WAM process provide a logical progression for conducting an assessment with community involvement, defensible scientific analysis, and credible management, monitoring, and restoration plans to address watershed impacts. The WAM process also allows sufficient flexibility to accommodate varying levels of community participation, technical assessment, and management plan development. Box 1 lists definitions for some commonly used terms in the WAM guide. A glossary at the end of the guide provides definitions for a complete list of technical words and jargon.

Box 1. Definitions for terms commonly used in the WAM guide

- Community resource: an environmental asset that has important cultural and economic value for the people of the region (e.g., drinking water, agricultural land, fish, wildlife).
- Delivery potential: the likelihood that a hazardous input will be transported to a community resource.
- Hazardous input: any element of the ecosystem that can affect a community resource (e.g., sediment, nutrients, heat).
- Resource sensitivity: the responsiveness or susceptibility of the environmental asset to hazardous inputs.
- Watershed process: a natural system of interactions in the environment (e.g., water movement, erosion, nutrient cycling).

Figure 1. WAM five-step process



While this guide advocates a structured and comprehensive approach to watershed assessment, it is important to recognize that watershed-based management is an iterative process that requires an ongoing effort of assessment, planning, monitoring, and communication. Environmental programs that address one or more of these steps may already exist. WAM can help to evaluate and refine these programs to most effectively address watershed-scale problems. Resource management information will need to be collected and analyzed over the long term to provide a sufficient understanding of watershed conditions. It may also take many years of building partnerships to create and implement a watershed management plan for public and private land within the community.

Scoping



The Scoping process helps to organize and focus the leadership of small and large watershed groups on priority watershed issues. The WAM guide provides guidance on developing a goal-oriented strategy, producing realistic action plans, addressing financial needs, and implementing priority projects. It will also help the watershed group decide on how to strategically engage and interact with the local

community. Effective changes in watershed management usually cannot happen without broad community involvement and support. The challenges of community participation, however, may necessitate a phased WAM approach that allows for background data collection and more communication time to better address inevitable issues of jurisdiction, overlapping authorities, and risk management.

The Scoping section also discusses important project and information management needs. The WAM process generates a great deal of information that can be valuable when considered in a long-term management framework. It is important to create a process for consistently collecting, storing, and displaying watershed data through tools such as computer databases and geographic information system (GIS) map layers so that results can be summarized and communicated effectively.

Watershed Assessment



The Watershed Assessment step provides an opportunity to collect information about key ecosystem processes that can be used to interpret watershed conditions and help guide restoration efforts. This section provides examples of common watershed issues, the technical modules that typically relate to each issue, and the critical questions within each module that may be applicable. This information can be used to focus the assessment on specific parts of the ecosystem.

Consultation among community representatives and the technical team is encouraged to make sure that the appropriate information is collected while maintaining an interdisciplinary and comprehensive assessment. The section also provides guidance on collecting important background information and managing the assessment process.

The Technical Modules are organized into eight sections to evaluate various aspects of the ecosystem. They contain a description of methods and tools that can be customized to address the watershed issues and project goals identified in Scoping. The Community Resources, Aquatic Life, Water Quality, and Historical Conditions modules address the current and historical distribution and condition of important resources in the watershed. The Hydrology, Channel, Erosion, and Vegetation modules address the physical and ecological setting of the watershed and the effects of land use practices over time.

Separating the assessment into technical modules provides a structured approach to ecosystem analysis and the flexibility to focus on critical watershed resources and processes. Critical questions within each technical module provide additional flexibility to refine the analysis and use only the applicable tools and methods. A table at the beginning

of each module lists the critical questions along with the kinds of methods or tools available to answer the critical question. Depending on the objectives of the analysis, some modules or critical questions may not be necessary to complete a watershed assessment. Alternatively, modules may be combined into one analysis effort (Box 2).

The methods and tools described in each technical module are divided into two categories: Level 1 and Level 2 assessment. Any combination of Level 1 and 2 assessment

Box 2. Combining modules

Combining tools and methods from multiple modules can provide an efficient and effective assessment process. The following combination of modules may be desirable:

- Community Resources/Historical Conditions
- Erosion/Channel
- · Channel/Aquatic Life
- Hydrology/Channel

Box 3. Potential objectives of a Level 1 assessment

- Summarize general watershed characteristics
- Describe key watershed issues
- Identify important gaps in information
- Prioritize further assessment or monitoring needs

can be conducted depending on the objectives of the assessment. Level 1 methods and tools rely on existing information to summarize and evaluate the current state of knowledge about the watershed (Box 3). These methods and tools are described in each module as a series of steps to provide useful products and a comprehensive assessment. This "cookbook" approach can be helpful for users who have limited resources or limited experience with watershed-scale

assessments. Level 1 assessments generally require a few weeks of work for each module, but the actual time will depend on factors such as the watershed size and availability of data. Box 4 provides examples of the products of a Level 1 assessment.

Box 4. Summary of possible Level 1 technical module products

Resource Modules

Community Resources

- · Locations of community resources
- Map of community resource sensitivities
- · Ecological needs of each resource
- · Land use impacts on each resource

Aquatic Life

- · Map of species distribution
- Assessment of habitat conditions
- · Map of habitat sensitivities

Water Quality

- · Locations of beneficial uses
- · Applicable water quality criteria and standards
- Potential sources of pollutants
- Map of water quality sensitivities

Historical Conditions

- Historical timeline
- · Trends in resource conditions
- Map of historical sites

Process Modules

Hydrology

- Climate summary
- · Characterization of runoff processes
- · Characterization of stream runoff
- Potential land use impacts (e.g., dams, dikes, urban and rural development, irrigation, grazing)

Channel

- Map of stream network
- Channel classification (stream channel gradient and confinement, sinuosity, or other physical features)
- Map of channel types
- Summary of land use impacts

Erosion

- · Summary of geology and soils
- · Relationship between land use practices and erosion
- Map of erosion hazards

Vegetation

- Map of vegetation communities, riparian areas, and wetlands
- List of threatened and endangered plant species
- Summary of historical changes in vegetation and land use impacts

The Level 2 methods and tools are more technical and typically require experienced analysts (Box 5). The Level 2 section of each module provides a "menu" of

approaches that includes for each approach a general description, guidance on its appropriate use, and technical references for more detailed information. The purpose of the Level 2 section is to provide a list of options for a detailed watershed assessment rather than specific directions on how to implement the approach. A Level 2 assessment often requires field surveys and a time frame of several months to complete. The methods also require a good deal

Box 5. Potential objectives of a Level 2 assessment

- Supplement existing watershed data to test hypotheses
- Establish cause-and-effect relationships among management activities and watershed conditions
- · Delineate specific areas that require special management
- · Establish monitoring requirements and criteria
- Identify cost-effective restoration projects

of professional judgement to evaluate the applicability of the tools, understand the limitations of the methods, analyze the data, and objectively interpret the results.

While the modules are separated to provide more flexibility in the assessment, interdisciplinary discussion and shared data collection among technical modules is an important component of the assessment (Box 6). The Synthesis step provides a formal setting for integrating information on various aspects of the ecosystem into

Box 6. Icons

Water Quality
Channel
Vegetation

This icon appears in the margins of the technical modules to highlight parts of the assessment for which information exchange and consultation with other module analysts may be helpful.

a holistic understanding, but integration also occurs during the Watershed Assessment. A great deal of interaction among technical module analysts is necessary to further understanding of complex, interconnected ecosystem processes.

Synthesis

The Synthesis section describes a process to integrate the results of the Watershed

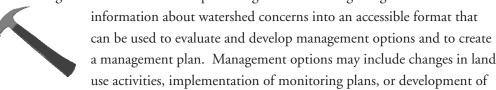


Assessment and to summarize important findings. Synthesis provides an opportunity for formal interaction among different scientific disciplines to provide a more comprehensive picture of the watershed. This part of the WAM process can also provide

an opportunity for interaction between technical and non-technical participants to improve understanding of watershed conditions and potential interactions among land uses, watershed processes, and community resources. In addition, Synthesis may be used to help evaluate risks to important resources.

Management Solutions

The Management Solutions section provides guidance on integrating technical



restoration plans. The development of management options is generally more effective with community-wide participation, but local, state, or federal agencies may have the ability to implement some management options on their own.

Adaptive Management

The Adaptive Management section describes the role of research and monitoring



in addressing gaps in information and ensuring the effectiveness of management solutions (Box 7). The uncertainties in our understanding of natural systems and in the effectiveness of management actions

require the use of adaptive

management. Guidance is provided to identify specific objectives for new scientific research or development of monitoring plans. This information can be invaluable for developing defensible, long-term watershed management plans.

Box 7. Monitoring objectives

- Implementation: Evaluate whether management plan was properly completed
- Effectiveness: Examine whether the proposed changes resulted in desired effects
- Validation: Confirm assumptions, evaluate predictions, and research trends